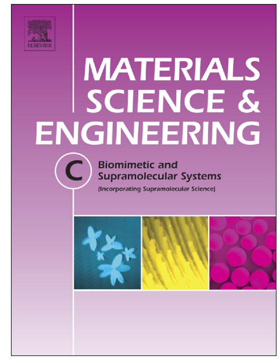
# Accepted Manuscript

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PII: S0928-4931(17)34575-7
DOI: doi:10.1016/j.msec.2018.09.032
Reference: MSC 8895

To appear in: *Materials Science & Engineering C*

Received date: 28 November 2017
Revised date: 7 August 2018
Accepted date: 10 September 2018

# Bi-layered silane-$TiO_2$/collagen coating to control biodegradation and biointegration of Mg alloys

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**Abstract**

Magnesium alloys have shown high potential as biodegradable implants for bone repair applications. However, their fast degradation in physiological media demands tuning their corrosion rate to accompany the natural tissue healing processes. Here, a new bi-layered silane-$TiO_2$/collagen coating efficient in stabilizing and biofunctionalizing the surface of AZ31 and ZE41 Mg alloys is presented. Corrosion tests performed in cell culture medium over 7 weeks showed that the bi-layered coating promotes the formation of a stable layer of $Mg(OH)_2/MgCO_3/CaCO_3$ that provides effective protection to the alloys at advanced immersion stages. The intrinsic reactivity of each alloy plus formation of transitory calcium phosphate phases, resulted in distinct corrosion behavior in the short term. Cell experiments showed that the bi-layered coating improved osteoblasts and fibroblasts proliferation compared to bare and silane-$TiO_2$-coated alloys. Different responses in terms of cell adhesion could be related to the intrinsic corrosion rate of each alloy and some toxicity from the alloying elements. The results evidenced the complex interplay between alloy nature, coating-alloy combination and cell type. The silane-$TiO_2$/collagen coating showed to be a promising strategy to improve cell response and viability and to control degradation rate of Mg alloys in the long term.

*Keywords*: Magnesium alloys; Coatings; Collagen; Biodegradation; Cell-material interactions.